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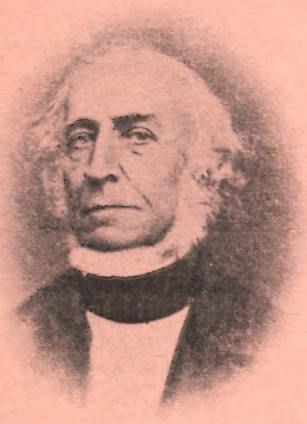

Major John Eatton Le Conte, 1784-1860.

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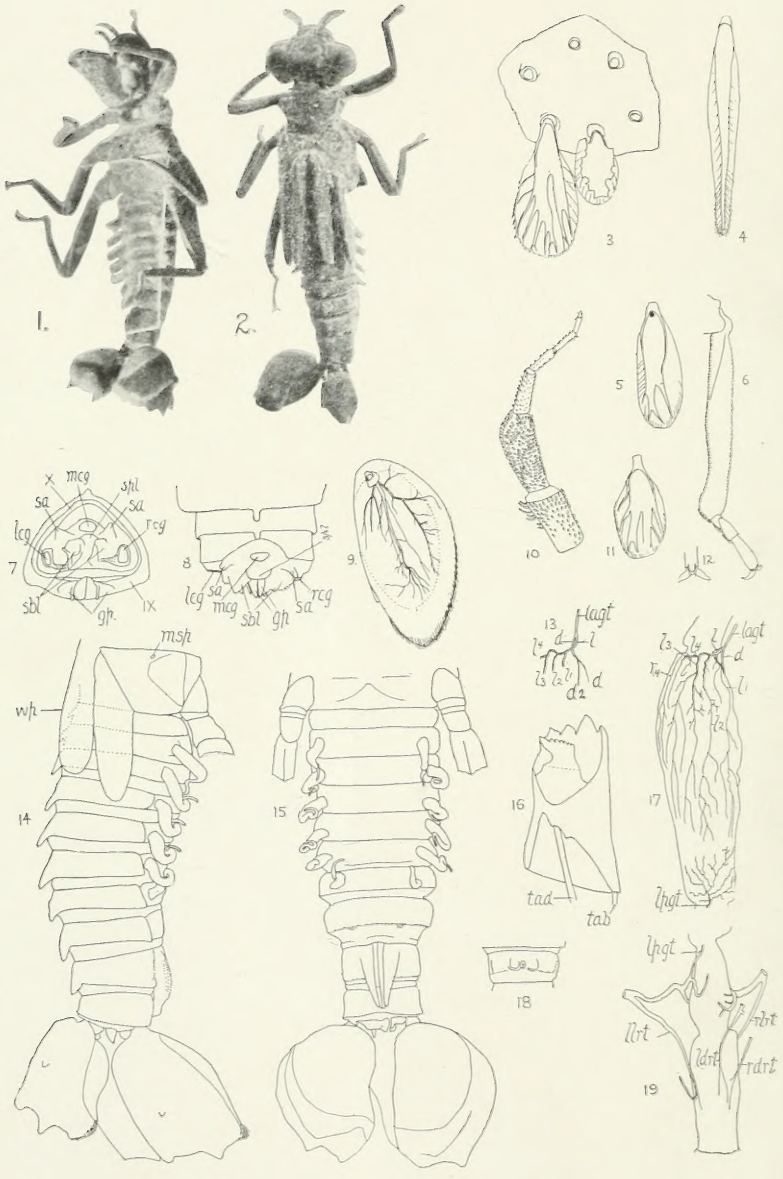

LARVA OF CORA (ODONATA)—CALVERT.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXII. FEBRUARY, 1911. NO. 2.

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Studies on Costa Rican Odonata.

I—The Larva of Cora.

By PHILIP P. CALVERT, PH. D.

University of Pennsylvania, Philadelphia, Pa.

(With Plates II and III)

In the course of our entomological researches in Costa Rica, a brief outline of which has already appeared in ENTOMOLOGICAL NEWS,* I collected some Odonate larvae of a form hitherto undescribed and which, it now appears, are certainly of the genus *Cora*. One of these was found at Peralta, Costa Rica, March 24, 1910, in a shallow brook in the woods west of the railroad station, clinging to a submerged stone. The altitude was about 335 meters, or 1100 feet. This larva died a few days later and was preserved in alcohol. A second is recorded in our diary, from Juan Viñas, April 27, 1910, as follows: "About half a mile farther [westward from the farther waterfall along the railroad from Juan Viñas station] is a third fall, or rather cascade, reached by a little trail through a bit of exceedingly thick damp woods full of wild ginger [*Costus* sp., Costa Rican name cañagria], heliconias,

* Vol. XXI, pp. 334-337, July, 1910.

ferns and caladiums. The stream is extremely pretty and ought to be a favorite haunt of many forest-loving species, but the day was very dark with intervals of rain and we saw no adult dragonflies. After long hunting among the fallen leaves and stones of the brook, P. found a larva with extra gills along the sides of the abdomen. This we suspect may be the larva of *Cora,* a point still to be determined however."

The diary for April 29, 1910, also at Juan Viñas, reads: "To-day was exceedingly dark and at times with very thick mist, altho' there was no heavy rain. While A. wrote in the morning, P. collected some food for some living dragon-larvae gathered here. While so doing he found another and somewhat larger larva of the sort which we suspect to belong to the genus *Cora.* It is remarkable in having attached to each side of some of the forward abdominal segments a finger-like gill, a peculiarity possessed by no other American dragon-larva as far as known. Our chief interest in larva-raising now centres on these two individuals."

Still at Juan Viñas, the diary of May 2, 1910, records: "With a lunch, rubber poncho and umbrella, the latter two for investigating the farther waterfall, I set out for that spot, examining the ditch along the [railroad] tracks which carries the water from this fall. In going and coming, I found in all three of the supposed *Cora* larvae in this outflow. Those found last week lacked the caudal gills which, altho' forming part of the proper equipment of a whole suborder of dragonfly larvae, seem to be of indifferent use and value, for many larvae lose them by accident or by the bite of a brother or an enemy and yet pass their larval existence as tranquilly and accomplish their transformations as successfully as their brethren. * * * The three larvae found to-day have their caudal, as well as their lateral, abdominal gills, which latter have already been briefly mentioned. The three caudal gills are very odd-looking. They appear as if cut off straight across the tip, instead of tapering as usual, the straight edge [*i e.* tip]then scalloped into three points. Each gill is much inflated and, as the gills

are each [a fifth] as long as the short 'pudgy' body, the effect is to give the larva the appearance of 'tail-heavy.' When first taken into the hand these three larvae remained motionless, 'playing 'possum' as it were for a minute or two, and then took to their legs with some speed. In spite of their double equipment of gills, the *Cora* (?) larvae found do not frequent a different abiding place from less richly 'engilled' dragons, their fellow inhabitants being larvae of *Hetaerina, Argia* and common types of Libellulinae." The ditch in which these larvae were found was at this time one to two feet wide and rarely as much as eight inches deep; it contained many small stones on the under sides of which the larvae were found. The waterfall, whose outflow it was, was perhaps thirty feet high and was in turn fed by a stream descending in occasional cascades through forest from a height of several hundred feet higher. We took or saw imagos of *Cora chirripa* at this waterfall in different months, at previous visits, and on April 30 and May 2, 1910. The altitude at which all the *Cora* larvae from Juan Viñas were found was about 1000 meters, or 3300 feet.

On April 30, 1910, Mrs. Calvert went from Juan Viñas to our headquarters at Cartago, taking with her the *Cora* larvae of April 27 and 29, and placed them in our rearing jars. I followed on May 4 with the three larvae of May 2. At 6:50 P. M. of the same day occurred the great earthquake which destroyed Cartago. Its effect upon our larvae in rearing has been briefly described in the NEWS as quoted, but by the greatest good fortune the bottle containing the *Cora* larvae of May 2 was the single one—of all our living Odonata— that rolled out and escaped destruction from the fallen wall. Two of the larvae were alive and were carried in safety to our steamship at Port Limon. A second died May 7, and the third, with a supply of mosquito eggs to furnish food, started with us on the voyage to New York, but expired on May 14, three days before we landed. Each larva, as soon as its death was discovered, was placed in alcohol, but evidently was not in a condition for histological study. This fact must be remembered in judg-

ing of the shrunken condition of some parts, *e. g.* the tissues represented in figs. 20 and 25.

There thus have been available for the present description four larvae which may be designated as follows:

No. 1. ♂. Peralta as above, total length including antennae and caudal gills 16.5 mm.; length of body excluding the parts named 11.5 mm.

No. 2. ♀. Juan Viñas, May 2, in fragments.

No. 3. ♂. Juan Viñas, May 2, measurements as above, 20.5 and 17 mm. respectively.

No. 4. ♀. Juan Viñas, May 2, measurements the same as those of No. 3.

No. 3 has furnished dissections of internal organs. Nos. 1 and 4 have been kept almost intact.

Description of the Larvae.

Head deeply concave posteriorly (Plate III, fig. 21) for reception of the prothorax. Compound eyes and ocelli distinct. Six pale yellowish spots indistinctly visible on the upper surface of the head, two in front of the median ocellus, one anterior to and one posterior to each lateral ocellus; some of these spots wanting in some specimens.

Antennae 7-jointed, but the last joint only visible under the compound microscope (Pl. II, fig. 10); ratios of the lengths of the joints, in a detached antenna under a cover-glass, 21, 26, 17, 11, 9, 5.5, 3; joints 1 to 6 successively decreasing in thickness; joints 1 and 2 clothed with a dense pile, which is longest in larva No. 1, and consists of flattened scales as shown in fig. 5. A similar pile is found on many other parts of the body, such as the anterior margin of the nasus, the lateral margins of the head posterior to the middle of the compound eyes, margins and ridges of the thoracic and abdominal segments, of legs and of wing-pads, a transverse ante-apical line on abdominal segments 1-10 for the entire width of the dorsum, much of the surfaces of the caudal gills, etc. This pile is longer and more conspicuous on larva No. 1 than on the other three. Joints 3-7 of the antennae have a decreasingly smaller amount of pile.

Mandibles stout two-branched, external branch larger, its apex with five teeth, first two teeth, counting from the dorsal margin, less distinct from each other than are the other three, fourth tooth longest. Internal branch in larvae Nos. 1, 3 and 4 larger on the *left* mandible than on the right mandible (right mandible lacking in larva No. 2) and on the left mandible its apex is truncated and with seven teeth or crenations, dorsal-most largest (Plate II, fig. 16). On the right mandible the apex of the internal branch is pointed and has only two teeth.

Maxillae with the inner lobe attenuate at tip, which bears three short internal teeth, and three long, slender, curved, internal processes and a row of strong setae. (Pl. III, figs. 29, 31). *Labium*, when folded at rest, reaching back to the bases of the prothoracic legs but not as far as the hind ventral prothoracic margin; median (mental) lobe but very slightly produced distad in the middle and with a very slight median cleft, distal margin crenulate with a very short seta between each crenulation and its neighbor; just within the crenulations a short distance on each side of the median cleft is a small pointed tooth (fig. 28, *t**) on the dorsal surface; mental setae few (2-4 on each side of the median line both on dorsal and ventral surfaces) and short; lateral lobes with a long curved tapering terminal spine and three distal teeth of which the most internal (mesial) is shortest and is truncate while the other two are pointed. (Pl. III, figs. 27, 28, 30).

Prothorax with three lateral tubercles, a dorso-lateral (*a*) which is dorsal to an antero-lateral (*b*) and, posterior to (*b*), a postero-lateral (*c*). On the mesothorax the place of *a* of the prothorax is occupied by the spiracle, *b* is present while *c* is represented by a double tubercle. None of these tubercles are represented on the metathorax which has an indistinct spiracle on its lateral surface (Pl. II, 14, *msp*). Front wing pads reach to the hind end of abdominal segment 6 in larva No. 1, to the hind end of segment 4 in larvae Nos. 3 and 4. Hind wing-pads reach almost to the mid-length of segment 7 in larva No. 1, to mid-length of segment 5 in Nos. 3 and 4. (In Pl. II, fig. 14, the wing-pads have been divaricated and are not in exactly normal positions, hence the difference between the preceding sentence and the figure). Legs not of a burrowing type, tarsi 3-jointed with an empodium-like structure (Pl. II, figs. 6, 12).

Abdomen triangular in cross-section, of ten complete segments, which decrease slightly in width from 1 to 8; 9 and 10 distinctly narrower owing to their lateral margins not being produced laterad as far as on the segments preceding (Pl. II, fig. 15). A curved, caudad-directed, mid-dorsal hook on segments 2-9 (larva No. 1) or 1-9 (larvae Nos. 3 and 4), hooks increasing in length from segment 1 or 2 to segment 7 or 8, that of 9 slightly shorter than that of 8. (Pl. II, fig. 14). Hind dorsal margin of segment 10 with a wide median notch whose depth is half, or less than half, the length of the segment. (Pl. II, fig. 8). Segments 2-7 each with a pair of tapering, finger-like ventral gills. Rudiments of ♂ genitalia on the ventral side of segment 2 indistinct in larva No. 1; in larva No. 3 they consist of two distinct black lines reaching from the intersegmental groove of 1-2 to behind the hind end of the sternite of 2. Rudiments of ♂ gonapophyses are present on segment 9 of larvae Nos. 1 and 3 (Pl. II, fig. 18). Rudiments of ♀ gonapophyses are shown in Pl. II, figs. 7, 8, 14, 15.

The three caudal gills together are much wider than the abdomen at its widest part. Each one is petiolate at base and much enlarged in all diameters beyond the petiole. *Median gill* approximately equal in length to that of segments 8+9+10, much enlarged dorso-ventrally and less so laterally immediately after the petiole, thence increasing in height gradually and slightly to the apex which is triangulate in profile view, the ventral angle most obtuse, the median angle most acute, the dorsal angle projecting not as far caudad as the other two. At a little less than half length from the base there is an angular protuberance on each side at about one-fourth height of the gill from the dorsal crest, so that there are in all five angular projections on this gill. Most of the chitin of this gill is brown and opaque, or at most only translucent, and is covered with scales, but on each of the two lateral faces there is an area of colorless transparent chitin occupying the ventral two-fifths of the height and about four-fifths of the length from the base caudad (Pl. II, fig. 14) lacking scales.

Each lateral caudal gill is somewhat longer than the median gill, roughly triangular in cross-section, one surface being convex, the other two approximately plane. These latter two are ventral and internal (mesial) respectively, the convex surface is lateral (external) and dorsal and greater in extent than either of the other two. There are four angular protuberances: one at half-length, or a little less than half-length, of the gill on the middle of the convex dorso-external surface; one at three-fourths of the length of the gill on the convex surface close to the margin of the mesial surface; one at seven-eighths of the length of the gill on the middle of the convex surface; and one, the most obtuse, forming the apex of the gill. The convex dorso-external surface of the gill is of brown chitin and scale-covered, the ventral and mesial surfaces chiefly of colorless, transparent chitin and lacking scales, except along the margins where each meets the dorso-external surface respectively. (Pl. II, figs. 3, 4, 9, 14, 15).

Between the bases of the three caudal gills are the rudiments of the superior appendages or 'cercoids' of the imago (Pl. II, figs. 7, 8, *sa*) and the supra-anal (*spl*) and sub-anal (*sbl*) laminae. The rudiments of the 'cercoids' are simple, cylindrical or conical, with rounded apices, and vary in length, in the four larvae, from about one-third to more than one-half of the length of abdominal segment 10. The sub-anal plates reach to about mid-length of the 'cercoids'; each one is depressed, its apex squarely truncate but produced apparently into a short spine at its mesial angle when viewed dorsally or ventrally; this apparent spine is the end view of a vertical lamina.

The main abdominal *tracheal* trunks and their branches are shown in Pl. III, figs. 22, 20; Pl. II, figs. 9, 17, 19. The ventral gills of abdominal segments 2-7 receive each two tracheae from two separate

branches of the main lateral trachea and the gill tracheae divide and redivide inside each gill (Pl. III, figs. 20, 25, 26). Owing to the opacity of the chitin, the thickness of the gills and the obstacles met in clearing them, I have not been able to make out more than the main branches of the tracheae supplying the caudal gills (Pl. II, fig. 9). The stomach is supplied from two anterior and two posterior tracheae, one anterior and one posterior on its right side and similarly on its left side. The right and left anterior gastric tracheae lie parallel and close together on the dorsal surface of the oesophagus and crop; each is probably a derivative from the main dorsal trunk of its own side of the body, but this was not definitely ascertained. At the anterior end of the stomach each anterior gastric trachea divides into a set of (two) dorsal and a set of (four) lateral branches as shown in Pl. II, figs. 13 and 17. The fourth, or ventralmost, lateral branch apparently forms an anastomosis with the corresponding branch of the opposite side of the stomach.

The hind-gut or intestine is likewise supplied by branches from the main dorsal tracheal trunks. The trachea which passes to the ileum also furnishes the posterior gastric trachea for the same side of the stomach. The rectal epithelium appears to form three (glandular?) dorsals and two laterals. (Fig. 19, *rdrt, ldrt, rlrt, llrt*). After the drawings forming figures 13, 17 and 19 were made, the alimentary canal was slit open lengthwise, stained, dehydrated, cleared and mounted in balsam. No definite indications of rectal tracheal gills were found and the rectal walls appear much less richly tracheated than those of the stomach. The rectal epithelium appears to form three (glandular?) areas. The gastric epithelium was disintegrated. No food was found in the alimentary canal.

The three thoracic pairs of ganglia are clearly distinct from each other. Posteriorly are seven pairs of smaller ganglia, located as follows: 1 in metathorax, 2 in anterior part of abdominal segment 2, 3 in hind part of segment 3, 4 at the articulation of segments 4 and 5, 5 in anterior end of segment 6, 6 in anterior end of segment 7, 7 in the middle of segment 8. The nerve cord in the male larva dissected (No. 3) passed to the right of the distinct rudiments of the genitalia projecting dorsad into the cavity of segments 1 and 2.

Discussion of the More Interesting Features of Cora Larva.

In current classifications *Cora* is placed in the Calopterygine or Calopterygidae (= Agrioninae of the catalogues of Kirby, Muttkowski, etc.). Most of the Calopterygine larvae

hitherto described (Cf. Karsch, 1893, pp. 42, 48; Needham, 1903*b*, p. 220) have the first antennal joint very long, as long as all the other, or as several of the other, joints added together. *Cora* larva has the first antennal joint shorter than the second and in this respect, as in others mentioned below, shows a resemblance to the Old World larvae described by Hagen (1880, p. lxv) as pertaining to the legion Euphaea* of de Sèlys, and to a Mexican fragment doubtfully referred to *Cora* (*l. c.*, p. lxvi).

The scales forming a more or less dense pile on different parts of the body of *Cora* larvae are structures which have met little or no notice in the literature on the Odonata. They occur in shapes varying from almost hair-like to that in which the width is at least more than half the length (Cf. Pl. II, figs. 4, 5, 11, 3 in the order named). The central and more or less arborescently-branched portion of each scale is thicker than the often hardly discernible marginal areas.

Biramous mandibles hitherto have been noted only in *Euphaea* larvae of all the Odonata, and that very briefly (Needham, 1903*a*, p. 743). I am not able at present to determine whether the two-branched condition there is the same as that here described for the larvae of *Cora* or not. The remarkable features of these mandibles is the possibility of independent movement of the inner branch along the dotted line shown in Pl. II, fig. 16, and the difference in the form of this branch in the right and left mandibles of the same individual noted above. Heymons (1896 *b*, taf. II, fig. 29) has figured the mandibles in a young larva of *Ephemera vulgata* which are also two-branched but, in contrast to the larval mandible of *Cora*, the inner branch is larger than the outer.

The very shallow median cleft of the median lobe of the labium was hardly to be expected in larvae so apparently primitive in other features as our *Cora* larvae are. In this respect also it agrees with *Euphaea* larvae, as far as can be

* The name of the type genus of this legion, *Euphaea*, is now replaced by *Pseudophaea* Kirby.

judged from Hagen's description (1880, p. xlv). If Miss Butler's theory (1904, pp. 114, 119) of the homologies of the labium be correct, then the small, pointed teeth (Pl. III, fig. 28 *t**) near the middle of the distal margin, would represent the apices of the original laciniae. The interpretation of Börner (1909, p. 113) is different and is essentially that of Gerstäcker, Heymons and others.

Hagen (1880, p. lxv) noted the existence of "une *plantula* entre les onglets" of *Euphaea* larvae and remarked (p. lxvii) "La présence d'une *plantula* entre les onglets est aussi un caractére unique chez les Odonates." The empodium-like structure mentioned above for *Cora* and shown in Pl. II, fig. 12, appears to be an homologous part.

The existence of tracheal gills on abdominal segments 2-7 is the most interesting feature of *Cora* larvae. The only Odonata previously known to possess such structures are the larvae referred to *Euphaea* and *Anisopleura* in the very brief description of Hagen (1880). One of these larvae was figured by Folsom in Packard (1898, p. 469). Hagen stated that there were gills on abdominal segments 1-8, Folsom found them on 2-8 only. There are, therefore, one pair less in *Cora* larvae. Hagen compared these gills of *Euphaea* and *Anisopleura* to those of *Sialis,* but makes no mention of Ephemerid larvae in this connection. Heymons (1896 *a,* pp. 88-90) compared the abdominal gills of Ephemerid and *Sialis* larvae, regarded them in both cases as derived from abdominal appendages and noted the agreement in the pointed form of the gills of the early larval stages of both groups. The gills of the second to seventh abdominal segments of *Cora* larva furnish an addition to this parallel. That the lateral gills of Ephemerid larvae are homologous with the thoracic legs is not universally accepted, however. Dürken (1907, 1909) and Börner (1909 *a*) are the latest representatives of the two views which look upon the Ephemerid lateral gills as dorsal and not homologous with legs and as ventral and homologous, respectively. We may not compare the lateral gills of *Euphaea,*

Anisopleura and *Cora* larvae with those of the Ephemerid larvae until much fuller data are at hand regarding the detailed structure, position, musculature and tracheation of each. The present study of *Cora* larvae supplies much fuller information than exists for either of the other two Odonate genera mentioned. The markedly ventral position of the gills in question in *Cora* is in itself some evidence against homologizing these structures with those of the Ephemeridae and in favor of their own serial homology with thoracic legs. No traces of these gills are present on the exterior of the abdomen of imagos of *Cora* preserved in alcohol immediately after capture.

The caudal tracheal gills of *Cora* larvae are very different in shape from the similarly situated gills of all other Odonate larvae yet described, including those of *Euphaea* (cf. Folsom's figure, *l. c.*) and *Anisopleura,* of which latter I possess a photograph from Hagen's specimen, taken and given to me by Prof. J. G. Needham. In both of these latter two genera the caudal gills taper posteriorly to an acute apex.

As related in the opening pages of this paper, the attempt to rear these larvae to transformation was unsuccessful. That they are the larvae of *Cora* and, so far as the Juan Viñas specimens at least are concerned, the larvae of *Cora chirripa* Calvert (1907, p. 348) is rendered practically certain from a comparison of the wing-rudiments of larva No. 4 with those of an imago of this species taken at the same ditch April 30, 1910. The left hind wing-pad of larva No. 4 was slit open, the wing rudiment removed from within and examined in alcohol under the compound microscope. The inner and outer surfaces of the rudiment gave the views represented in Pl. III, figs. 23 and 24 respectively. The veins shown in these figures are bands of reddish-brown pigment granules in the rudiment itself. The left hind wing of the imago mentioned was compared with camera drawings of the two surfaces of the wing-rudiment of the larva. At first the identification of the larval wing veins proceeded slowly until it occurred to me that per-

haps the two surfaces of the wing rudiment might present only convex and concave veins respectively. Turning then to the imaginal wing the following lists were made proceeding in every case from the anterior toward the posterior wing margin. Convex veins: proximal half of the wing, C, R1, R*s*, M4, A and Cu2; distal half, C, R1, M1*a*, two supplementary sectors, R*s*, three supplementary sectors, M4, Cu2*a*, Cu2*b*.

Concave veins: proximal half of wing, Sc, M1, M3, Cu1; distal half, M1, two supplementary sectors, M2, one supplementary sector, M3, two supplementary sectors, Cu1, one supplementary sector between Cu2*a* and Cu2*b*.

As is well known the inner surface of the wing-pad and wing-rudiment of an Odonate larva corresponds to the upper surface of the imaginal wing, and the outer surface in the larva to the under surface in the imago. On comparing the list of convex veins with the drawing of the inner surface of the wing-rudiment and the list of concave veins with that of the outer surface of the wing-rudiment, it was seen that a close correspondence existed with these exceptions: that C (costa) showed on both surfaces, as also did a thickening all along the posterior margin and to greater or less extents Sc (sub-costa), R1 (first branch of radius), M1 (first branch of media), A (anal), Cu2*b* and the supplementary sector between Cu2*a* and Cu2*b*. The wing-rudiment was then cleared in cedar oil and examined in strong transmitted sunlight, when the vein-rudiments of both inner and outer surfaces could be seen from either surface by proper focussing, whereas before clearing only those of the surface turned up toward the lens could be discerned. All the vein-rudiments now appeared in their proper sequence giving the alternation of convex and concave veins so easily seen in an imaginal wing. Careful focussing also revealed the fact that at this stage the veins are developed only upon one surface of the wing-rudiment, either inner or outer, except in the case of the costa and of the thickening along the hind margin. The other exceptions noted above are all veins near the margins where the wing-rudiment is thinner

and where they can be seen through it. Even in these exceptions the veins appear fainter and narrower on one surface than the other and are stronger and wider on their proper surface, *e. g.* Sc and M1, concave veins, on the outer surface; R1, A and Cu2*b*, convex veins, on the inner surface.

Another fact shown by these comparisons and the figures is that the cross-veins only appear continuous from one longitudinal vein to another when the two longitudinal veins so connected are two, one of which immediately follows the other in the imaginal wing. (Cf. the cross-veins between R1 and M1 and between M1 and M2 in Pl. III, fig. 24.)

It would thus appear that each longitudinal vein develops on one surface of the wing-rudiment before it appears on the other surface. Before transformation is reached each vein has formed on both surfaces of the future wing but not necessarily equally on both surfaces, as may be seen from Hagen's figures (1889) from photographs of wings split into their two laminae immediately after transformation and expansion.

These facts of the development of the veins on one surface of the wing-rudiment before the other have a practical value in identifying Odonate larvae by this method and do not seem to be included in Prof. Needham's (1904, p. 687) suggestions on this point.

In the larva of *Cora* there exist the following generalized features: antennae with no hypertrophied joint, biramous mandibles, paired ventral tracheal gills (if they be morphologically equivalent to legs), and perhaps the empodium-like part, side by side with specialized features in the form of cuticular scales, almost completely fused halves of the labium and thickened, shortened caudal gills. If to these generalized parts of the larva we add the generalized features of the imaginal venation pointed out or implied by Prof. Needham (1903*a*, pp. 731, 746), we have good grounds for looking on *Cora* and its allies as being in many respects the most primitive of living Odonata.

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EXPLANATION OF PLATES II AND III.

Larva of *Cora*.

Fig. 1. Left latero-ventral view of larva No. 4 ♀.

Fig. 2. Dorsal view of larva No. 3 ♂. Right caudal gill lacking. Figs. 1 and 2 from photographs of alcoholic specimens. × 2.6.

Fig. 3. Small fragment of surface of left caudal tracheal gill, larva No. 3, showing two scales and four articular pits for others. × 210.

Fig. 4. Scale from same gill as fig. 3. × 210.

Fig. 5. Scale from first antennal joint shown in fig. 10. × 210.

Fig. 6. First left tibia and tarsus of larva No. 4. × 8.5.

Fig. 7. End view, hind end of abdomen of larva No. 2 ♀, caudal gills removed. × 8.5.

Fig. 8. Dorsal view, hind end of abdomen of larva No. 2 ♀, caudal gills removed. × 8.5.

Fig. 9. Left caudal gill, ventro-mesial view, combined from drawings from larvae Nos. 1, 2, 3, to show tracheation. The dotted line indicates the boundary between a central, clearer, unscaled area and an opaque, scaled margin. × 5.8.

Fig. 10. Right antenna, dorsal view, larva No. 3, ♂. × 16.5.

Fig. 11. Scale from tibia or tarsus of fig. 6. × 210.

Fig. 12. Ventral surface of distal end of tarsus. × 8.5.

Fig. 13. Dorsal view of branches of left anterior gastric trachea shown in fig. 17. × about 12.5.

Fig. 14. Right lateral view of metathorax and abdomen of larva No. 4, ♀. × 5.5.

Fig. 15. Ventral view of same. × 5.5.

Fig. 16. Left mandible, mesial surface, larva No. 2, ♀. × 21. The dotted line shows the line of flexure of the internal branch.

Fig. 17. Left side of stomach to show tracheation, larva No. 3, ♂. × about 12.5.

Fig. 18. Ninth abdominal segment to show gonapophyses, larva No. 3, ♂. × 5.5.

Fig. 19. Left latero-dorsal view of intestine to show tracheal supply, larva No. 3, ♂; Malpighian tubules omitted. × about 12.5.

Fig. 20. Right gill of fifth abdominal segment, larva No. 3, ♂. The gill has been left untouched, the viscera of the segment removed with the exception of the tracheae supplying the gill. To the left of *chr* a portion of the chitinous ventral wall of the segment is shown, to the right of *chr* is a portion of the tergite which has been turned outward (laterad) to show the structures within the segment. The portions of the two main tracheal trunks *rdt* and *rlt* have been turned outward to give a clearer view of the branches to the gill. Compare with the fifth abdominal segment in fig. 22. × about 23.

Fig. 21. Dorsal view of head, larva No. 4, ♀. The dotted lines show the outlines of pale marks. × 7.8.

Fig. 22. Dorsal view of chief thoracic and abdominal viscera, larva No. 3, ♂. The body has been opened along the mid-dorsal line. The ganglion has been omitted from second abdominal segment, the

wing-pads from left side, the dorsal longitudinal abdominal muscles from the right; not all of these muscles (*dlm*) are shown even on the left side. × 7.8.

Fig. 23. Inner surface of left hind wing-rudiment (= upper surface of imaginal wing) with the outline of its enveloping wing-pad, *wp*, larva No. 4, ♀. × 12.4.

Fig. 24. Outer surface of the same (= under surface of imaginal wing). × 12.4.

Fig. 25. Transverse section of right gill of sixth abdominal segment of larva No. 3, ♂. × 55.5.

Fig. 26. Transverse section of chief tracheal trunk of same gill in section immediately following that shown in fig. 25. × 55.5.

Fig. 27. Distal end of lateral lobe from fig. 30. × 28.

Fig. 28. Inner (dorsal) surface of distal end of median lobe from fig. 30. × 28.

Fig. 29. Distal end of left maxilla from fig. 31. × 25.

Fig. 30. Ventral (outer) surface of labium, larva No. 2, ♀. × 8.

Fig. 31. Left maxilla and hypopharynx, ventral view, larva No. 2, ♀. × 13.

Abbreviations Used in the Plates.

A, Anal vein (= proximal part of second sector of triangle of Selys).
chr, Chitinous ridge forming lateral margin of an abdominal segment.
Cu1, Cu2, First and second branches of cubitus vein (= first and distal part of second sectors of triangle of de Selys).
d, *d1*, *d2*, Dorsal branches of *lagt*.
dlm, Dorsal longitudinal muscles.
gm, Gill muscle fibres.
gp, Gonapophyses.
gt, Gill trachea.
im, Interarticular membrane between first antennal joint and head.
IX, Ninth abdominal segment.
l, *l1*-*l4*, Lateral branches of *lagt*.
lagt, Left anterior gastric trachea.
lcg, Point of attachment of left caudal gill.
ldt, Left dorsal trachea.
ldrt, Left dorsal rectal trachea.
llt, Left lateral trachea.
llrt, Left lateral rectal trachea.
lpgt, Left posterior gastric trachea.
M1, *M2*, *M3*, *M4*, Branches of media vein (= principal, nodal, median and short sectors of de Selys respectively).
M1a, Branch of *M1* (=ultra-nodal sector of de Selys).
mcg, Median caudal gill.

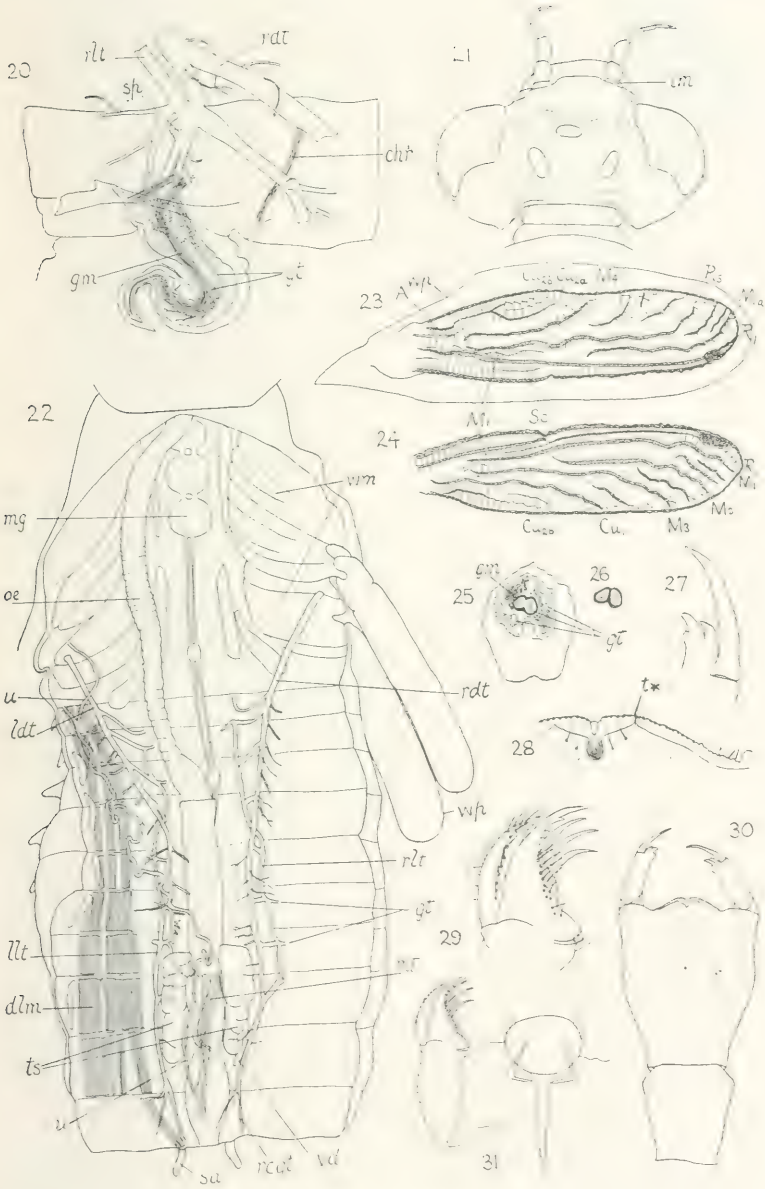
mg, Metathoracic (+ first abdominal?) ganglion.
msp, Metathoracic spiracle.
mt, Malpighian tubes.
oe, Oesophagus.
*R*1, First branch of radius vein (= median vein of de Selys).
*r*4, Fourth lateral branch of right anterior gastric trachea.
rcg, Point of attachment of right caudal gill.
rcgt, Right caudal gill trachea.
rdrt, Right dorsal rectal trachea.
rdt, Right dorsal trachea.
rlrt, Right lateral rectal trachea.
rlt, Right lateral trachea.
Rs, Radial sector (= sub-nodal sector of de Selys).
sa, Superior appendages of imago ('Cercoids').
Sc, Subcosta vein.
sbl, Sub-anal lamina.
sp, Site of future spiracle.
spl, Supra-anal lamina.
tab, Tendon of abductor mandibulae.
tad, Tendon of adductor mandibulae.
ts, Testes.
*t**, Tooth on median labial lobe.
u, Undetermined tube.
vd, Vas deferens (beginning of).
wm, Wing muscle.
wp, Outline of wing-pad.
X, Tenth abdominal segment.

The Tenth Pleocoma (Col.).

By H. F. Fall.

On the 12th of last October, Mr. Chas. Camp, a student in the Pasadena High School, while repairing a trail in a small canon in the mountains near Sierra Madre, cut into a large beetle a few inches below the surface, the remains of which he brought to me for identification.

The specimen proved to be a female Pleocoma; a most interesting discovery, inasmuch as no representative of the genus had ever been found in this vicinity. One hundred and fifty miles north, along the South Fork of the Kaweah River



LARVA OF CORA (ODONATA)—CALVERT.

is the home of *P. hoppingi;* from the Cuyamaca Mts., one hundred miles south came the unique type of *P. puncticollis,* and in the Santa Monica Mts., near the coast, and not more than thirty miles distant a single wing cover of a *Pleocoma* has been picked up, showing the presence of the genus in that somewhat isolated range. The Sierra Madre Mts. ought then by good rights to harbor a species of this remarkable genus, but the obscure habits, and the ephemeral existence of the perfect insects has enabled them to escape detection up to this time.

In the absence of the male it was not possible to identify Mr. Camp's specimen with certainty, and he was urged to keep a sharp lookout for males during or immediately following the next rain. This was done, and on the 15th of November during a drizzling rain nineteen males were taken in about an hour at the same spot in an area not more than one hundred feet across. The beetles flew slowly and apparently aimlessly, keeping as a rule a foot or two above the ground. Mr. Camp was unable to define the extent of the flight, either in time or space, but there is little doubt that both were quite limited. Unfortunately no special attempt was made to locate the females, and it is doubtful if it will now be possible to secure any this season.

A careful study of the males indicates rather close relationship with *fimbriata* and *puncticollis,* but with a sufficiently marked and constant deviation from either to warrant a distinctive name. The following description and comparative notes are therefore offered:

P. australis n. sp.

Male.—Black, shining, glabrous above, the long hairs of the marginal fringe and under surface reddish brown. Antennae and cephalic structure very nearly as in *fimbriata.* Prothorax slightly more than twice as wide as long in horizontal projection, sides arcuately convergent in front, subparallel and feebly or barely perceptibly sinuate posteriorly, the hind angles obtuse but well defined and usually slightly prominent; disk flattened and obliquely declivous in front, the median line broadly vaguely impressed anteriorly and again more narrowly

so for a short distance at base; sides with the usual impression; surface closely moderately coarsely punctate throughout. Elytra obviously wider at base than the prothorax, varying from a little less to a little more than 3-10 longer than wide, sides nearly parallel, surface finely lightly punctured between the feebly defined geminate striae.

Length, 24½-28 mm.; width, 14-15¾ mm.

Female.—Castaneous, of the usual robust form; the clypeus more narrowly but very distinctly triangularly emarginate; surface sculpture rougher than in the male, as is usual.

Habitat. Bailey Canon, San Gabriel Mts., near Sierra Madre, California; elevation 2500 ft.

Compared with *fimbriata* the present species differs most conspicuously in the more coarsely and closely punctured thorax and smoother elytra; there are, however, a number of other differences which are evident on closer attention. Three males in my collection from Eldorado Co. are undoubtedly typical representatives of *fimbriata;* all these agree in being relatively broader than any of the new series; the prothorax is scarcely narrower than the base of the elytra, with the sides more rounded posteriorly and with ill defined hind angles, the cephalic horn is also longer and more slender than in *australis,* in which it is distinctly more triangular when viewed laterally. In all my typical *fimbriata* the third antennal joint is shorter than the next two combined; in *australis* it is equal to the next two, and in *puncticollis* it is said to be longer than the two following. *Puncticollis* differs conspicuously in having the long hair of the under body black.

The committee appointed to represent and look after the interests of the International Entomological Congress for the United States consists of Dr. Philip P. Calvert, Prof. T. D. A. Cockerell, Prof. J. H. Comstock, Prof. H. C. Fall, Prof. C. P. Gillette, Dr. W. J. Holland, Prof. A. D. Hopkins, Dr. L. O. Howard, Prof. C. W. Johnson, Prof. V. L. Kellogg, Prof. Herbert Osborn, Dr. John B. Smith, Dr. Ch. W. Stiles, Dr. Creighton Wellman, Dr. W. M. Wheeler. The committee for Canada is Dr. C. J. S. Bethune, Dr. C. G. Hewitt, Henry H. Lyman. The Permanent Executive Committee consists of Dr. Malcolm Burr, Dr. Walther Horn, Dr. K. Jordan, P. Lesne, G. Severin, Henry Skinner.

The Executive Committee will meet in Paris in August of this year to arrange for the Second International Congress to be held in Oxford, England, in 1912.

Descriptions of New Species of Cynipidae (Hym.).

By WILLIAM BEUTENMULLER, American Museum of Natural History, New York.

Dryophanta clavula, sp. nov.

Female.—Head rufous, infuscated along the face and on the vertex around the ocelli, evenly and finely reticulately punctate, sparsely hairy, eyes black. Antennae 14-jointed, first joint stout, short, second joint much smaller and stout, third to sixth joints long and slender, third longest; remaining joints short and subequal, dusky brown, somewhat darker toward the tip. Thorax pitchy brown, rufous posteriorly and anteriorly at the sides, microscopically pitted, especially anteriorly, shining and with scattered decumbent, yellowish hairs. Parapsidal grooves deep and distinct, widely separated anteriorly and running obliquely backward to the scutellum, where they are close together. Median groove wanting. Anterior parallel lines broad, shining, smooth and scarcely extending to the middle of the thorax. Grooves at base of wings scarcely evident. Scutellum subopaque, dull rufous, finely and evenly rugose with an almost imperceptible basal groove. Abdomen pitchy brown, somewhat rufous ventrally, smooth, shining; ventral sheath yellowish with long hairs. Legs dull yellowish brown with short hairs. Wings hyaline, pubescent, veins brown, heavily marked, especially the cross-veins; apical region with about seven small brown dots and a larger brown patch, and with three large brown clouds about the middle of the wings. Radial area closed with the veins thickened at the costa. Areolet present. Cubitus faint and extending to the first cross-vein. Length 1.5-2 mm.

Gall.—On the under side of the leaves of a species of white oak (probably *Quercus douglasi*). Monothalamous. Narrow and almost parallel to about the middle, thence suddenly becoming inflated into a club with the apex pointed. At the extreme base it is slightly broader and is attached by a point to the leaf. The gall very much resembles a miniature Indian club in shape. Brown in color, and the larva lives in the inflated part of the gall in a rounded cell. Length, 5-7 mm.; width of narrow part, 1 mm., of thickened part, 1.75 mm.

Habitat:—California (Napa and Sonoma Countries). Described from twelve specimens.

Type—Collection U. S. National Museum.

Dryophanta multipunctata sp. nov.

Female.—Head yellowish brown, face broadly infuscated, eyes and ocelli black, microscopically, evenly granulose and pubescent. Antennae 14-jointed, first joint stout, second joint stout and much shorter than

the first; third joint very long and slender, fourth to sixth joints slender, subequal and shorter than the third; remaining joints gradually becoming shorter and slightly thicker toward the tip, pitchy brown black and pubescent. Thorax shining, finely and evenly pitted, with decumbent yellowish hairs, pitchy brown, somewhat rufous between the parapsidal grooves at the scutellum. Parapsidal grooves rather deep, widely separated anteriorly and converging at the scutellum, where they are moderately, widely separated. Anterior parallel lines very fine and indistinct. Lateral grooves distinct. Median groove wanting. Scutellum pitchy brown inclined to rufous, finely and evenly pitted, with yellowish hairs, basal groove not distinct. Abdomen pitchy black or dull rufous, smooth and shining dorsally, and covered with short pale hairs at the sides and venter. Legs pitchy brown or dull yellowish brown, pubescent. Wings hyaline, veins brown, cross-veins very heavy, outer portion of wings beyond the middle with many small brown spots, except in the radial area; about the middle of the wings two brown clouds situated on the veins. Areolet present. Cubitus continuous to the first cross-vein. Length, 2.75-3 mm.

Gall.—On the under side of the leaves of a species of oak. Monothalamous. Gray brown, spherical, sometimes slightly flattened at the base where the gall is attached to the leaf. The gall is irregularly wrinkled and covered with a dense, short and compact wooly substance and hairs. In general appearance it resembles the gall of *Philonix lanaeglobuli*. Diameter about 5 mm.

Habitat—Kern County, California, December 6th, 1892.
Type—United States National Museum.
Described from two specimens and two galls.

Holcaspis chrysolepidis sp. nov.

Female.—Head, thorax and scutellum pale yellowish brown, abdomen somewhat darker with the dorsal region infuscated; legs slightly paler with the claws black. Antennae yellowish brown, terminal joints darker. Head very finely and evenly granulated, pubescent; ocelli and eyes black. Antennae 14-jointed. Thorax finely and evenly punctate with pale decumbent hairs. Parapsidal grooves very fine, less distinct anteriorly and almost parallel. Anterior parallel lines distinct, shining and extending to the middle of the thorax. Lateral grooves sharply defined, long and shining. Scutellum hairy, finely and evenly rugose. Abdomen shining, smooth, with a small patch of hairs at the base laterally. Legs pubescent. Wings long, yellowish hyaline, veins yellowish and are usually closely pressed together. Width 5-10 mm. Height 4-7 mm.

Gall.—On the twigs of oak (*Quercus chrysolepidis*). Monothalamous. Hard woody. Irregular in shape, somewhat rounded, sides flattened.

slightly oblique, ridged around the upper part of the sides, apex rounded. They occur singly and in rows of two, three, four or more, and are usually closely pressed together. Width 5-10 mm. Height 4-7 mm.

Habitat—Placer Co., California, November and December.

Types—United States National Museum.

Described from nine examples.

The gall of this species was figured by me in the Bulletin of the American Museum of Natural History, Vol. XXVI, plate VIII, figs. 8 and 9.

Philonix californica sp. nov.

Female.—Head pitchy brown black, minutely rugose with scattered, short hairs. Antennae 13-jointed; first joint stout, cylindrical; second joint shorter, stout and rounded at the tip; third joint very long and slender; fourth, fifth and sixth joints slender and shorter than the third; remaining joints gradually becoming shorter and thicker toward the thirteenth, all pitchy brown and pubescent. Thorax pitchy brown or dull rufous, evenly rugose, somewhat wrinkled and with a few scattered hairs. Parapsidal grooves very fine and somewhat lost in the rough surface anteriorly, convergent at the scutellum. Scutellum evenly rugose like the thorax, and of the same color. Abdomen compressed convex at the sides and rather sharply keeled on the dorsum and venter, dark pitchy brown, smooth and shining. Legs pitchy brown, somewhat paler than the abdomen and pubescent. Wings aborted, not extending to the middle of the abdomen. Length 1 mm.

Gall.—On the upper surface of the leaves of a species of white oak. Monothalamous. Rounded, flattened disc-like, becoming slightly elevated toward the middle. The sides are flat and very thin, and the gall rests closely on the leaf. The larva lives in the center of the elevated part. The color is pinkish or purplish, with the apex sometimes yellowish. Width, 3 to 4 mm. Height, 1 mm.

Habitat—Kern Co., California, January.

Type—United States National Museum.

Described from five females.

Andricus caepulaeformis sp. nov.

Female.—Head large, broader than the thorax, reddish brown, evenly and finely granulose. Antennae 14-jointed; first joint very stout and inflated; second joint short, subcylindrical; third joint very long and slender; fourth joint also slender, shorter than the third, remaining joints subequal, all blackish except the basal one which is rufous. Thorax minutely granulose with a few hairs. Parapsidal grooves pres-

ent, but not prominent, almost parallel. Anterior parallel lines scarcely evident. Median line running from the scutellum to about the middle of the thorax, not distinct. Pleurae with a large, smooth shining area. Scutellum rufous, rugose, foveae at base oblique and opaque. Abdomen reddish brown, posterior half piceous, smooth and shining. Legs reddish brown, long and slender, pubescent. Wings (immature) hyaline, veins brown. Length, 4 mm.

Gall.—In clusters around the twig of black oak (*Quercus velutina*). Monothalamous. Rounded with the apex pointed, and the sides longitudinally grooved. The rounded part is hollow and rather thin walled, and the base of the gall is imbedded in a cavity in the twig. Rose colored, hard and woody (when dry). In general appearance the gall resembles a very small seed onion. Length 5-8 mm. Width 4-5 mm.

Habitat—Indiana. (Mel. T. Cook).

Andricus pisiformis sp. nov.

Female.—Head dark reddish brown, finely granulated and with short pale hairs. Antennae 13-jointed, reddish brown, terminal joints blackish. Thorax dark pitchy brown, reddish brown along the parapsidal grooves and laterally, minutely reticulated and with many pits, from each of which arises a short, decumbent, yellowish hair. Parapsidal grooves deep and well defined. Median groove distinct, and less so anteriorly. Lateral grooves deep. Anterior parallel lines not extending to the middle of the thorax. Scutellum reddish brown, rugose and with two large, deep, shining black foveae at the base. These are separated by a fine ridge. Pleurae pubescent, with a rather large shining area, pitchy brown. Abdomen subglobose, inflated, pitchy brown, smooth and shining. Legs brown, punctate and pubescent. Wings hyaline, veins brown, cross-veins heavy. Areolet small. Cubitus not reaching the first cross-vein. Length 2-3.50 mm.

Gall.—On the terminal twigs of white oak (*Quercus alba*) and post oak (*Quercus minor*) from the middle of May to early in June. Monothalamous. Spherical or pea-like. Milky white or pale greenish white, speckled and marbled with green or lilac. Fleshy when fresh, hard and woody when old and dry. It is hollow inside with no separate larval chamber. It is evidently a bud gall. Diameter 3-6 mm.

Habitat—New Jersey (Lakehurst); Massachusetts (Boston).

The flies mature in the gall during the latter part of September and in October, but do not emerge until the following spring. The gall is a pretty object and looks like a very small marble. The specimens on white oak from Boston were collected by Miss Cora H. Clarke at the Arnold Arboretum.

Studies Amongst the Coccinellidae, No. 2, (Col.).

By F. W. NUNENMACHER, Piedmont, California.

Since my last paper on Coccinellidae* several friends and correspondents have sent me material in various genera including several species new to science, and as some of these are of considerable interest it seems worth while to publish the following descriptions at this time:

Genus **PSYLLOBORA** Mulsant.

Psyllobora koebelei n. sp.

♂.—*Color*: Whitish yellow with chocolate brown markings disposed as follows: Pronotum with the five common discal spots, each elytron with one juxta-scutellar and one median basal dot, one marginal small dot placed a little before the middle, and one irregular blotch roughly quadrate in form, placed its own width from the margin and close to the suture and rather behind the middle. Mouth parts testaceous; ventral surface black except mesothoracic episterna, which are white and last four ventral segments, which are testaceous, as are the legs. Form convex, subovate; *head,* impunctate; *pronotum* very finely and sparsely punctured; *elytra* moderately coarsely punctured; *ventral surface,* sternum moderately coarsely punctured; abdomen smooth.

Length, 2.25 mm. *Width,* 2 mm.

Type—♂ in my collection.

Type locality—Nogales, Santa Cruz Co., Ariz. vi. 02. (Koebele)

This species, which feeds on the scale infesting mistletoe, comes nearest to *P. luctuosa* Muls., from which it can readily be told by the elytral design. The type was kindly given me by Mr. A. Koebele in whose collection there are several specimens. According to his observations (No. 2426), this species, when alive, has a ground color of beautiful shimmering silvery green.

Genus **AXION** Mulsant.

Axion incompletus n. sp.

♂.—*Color*: Head light ferrugineous, pronotum and elytra black, the former with the anterior angles ferrugineous and a beaded line of the same color along the entire anterior margin, each elytron with a median double coalescing spot at the callus, nearer the margin than the suture, the shape of this spot being obliquely and roundly oblong with a prolongation towards the base of the elytron; ventral surface uni-

* See ENTOMOLOGICAL NEWS for April, 1909, p. 161 ff.

formly ferrugineous except the head, which is infuscate, mesosternum, tibiae and tarsi piceous. *Form* as in *tripustulatus* DeG., *head* slightly nitid, almost impunctate; *maxillary palpi* black, last article inflated, somewhat flattened, truncate and excavated at apex; *pronotum* somewhat shining, almost impunctate; *scutellum* very small; *elytra* with texture as in head and thorax; *ventral surface* with sternum finely and thickly punctured, except the mesosternum, which is smooth and very nitid, ventral sternites finely, thickly and striately punctured except the base of the segments, which are smooth; fifth ventral rather deeply notched; *legs* with femora slightly rugose, tibiae smooth and sparsely pubescent.

Type—♂ in my collection.

Type locality—Lincoln Park Beach, Chicago, Ill., (Wolcott).

This form can be told at a glance from *tripustulatus* DeG. by the absence of the sutural spot. I owe the type to the kindness of my friend, Mr. Frederick Knab, of Washington, D. C.

Genus **HYPERASPIS** Chevrolat.

Hyperaspis lateralis, var. **flammula** n. var.

Color, structure and ornamentation as in *lateralis* Muls., except that the marginal vitta of each elytron is longer and is connected with the common discal spot by an isthmus of the same color as the vitta and spot; this isthmus rises from a point at about the posterior third of the vitta.

Type—♂ ♀ and one cotype (♀) in my collection.

Type locality—Montana.

Geo. Dist.—Montana, 2 specimens; Golden, Col. vii, 18. 09. one specimen (W. J. Gerhard).

I have seen examples of this variety in several collections in the east including the Horn collection of the American Entomological Society. The ♂ ♀ type was kindly given me by Mr. Chas. Liebeck of Philadelphia, the cotype from Colorado by my friend Mr. A. B. Wolcott. In the latter the elytral pattern shows slight signs of a reversion towards the typical design.

Hyperaspis wellmani n. sp.

Color: Shining black, elytra with reddish yellow markings, disposed similarly to those of *lateralis* Muls., except that the marginal vittae distinctly increase in width posteriorly and do not reach as nearly the

base of the elytra as in the species mentioned, also the discal and subapical spots are constantly smaller and regularly circular, ventral surface black except that portion of the reflexed margin of the elytra occupied by the marginal vittae. *Form* regularly oval; *head* very sparsely and minutely punctured; *pronotum* a little more heavily and thickly punctured; *scutellum* large with a few coarse punctures; *elytra* more thickly punctured than head, but less thickly than pronotum; *ventral surface* with mesosternum smooth, episternum of mesothorax very coarsely punctured. *Head* of ♂ chrome yellow, the anterior border of the pronotum narrowly, and the lateral borders heavily margined with the same color, the lateral margin not quite reaching the base, anterior pair of legs and tarsi of all yellowish.

♀.—Entirely black except elytral markings, tarsi dark fuscous.

Length.—♂ 2.5 mm., ♀ 3.1 mm.

Width.—♂ 1.7 mm., ♀ 2.1 mm.

Type—♂ ♀ and five cotypes, one ♂ and four ♀ ♀, in my collection.

Type locality—Goldfield, Esmeralda Co., Nevada, vi. 27. 07 (Nunenmacher).

In general form and markings the specimens are remarkably constant. I have many times bred *lateralis* and the larva of *wellmani* is strikingly different from that species. The following table will aid in separating the adults:

1. (2) Marginal vittae broad, not increasing posteriorly, episternum of mesothorax mediumly punctured, foveae for reception of hind tibiae rather shallow, size large and form more convex than the following species ..... **lateralis**
2. (1) Marginal vittae narrow, distinctly increasing posteriorly, episternum of mesothorax very coarsely punctured, foveae for reception of hind tibiae deep, size smaller and less convex than preceding species ..... **wellmani**

Hyperaspis wolcotti n. sp.

♀.—*Color*: Head, pronotum and scutellum black, the pronotum with rather wide stramineous lateral margins, elytra piceous with stramineous markings arranged as follows: A wide marginal, strongly sinuous vitta extending from the humeral angle of each elytron to a point near the suturoapical angle; for about its posterior third, this vitta does not entirely reach the margin of the elytron; a narrow edging of the elytral ground color appearing outside of the vitta; the apical end of the vitta is constricted near the extremity tending to form an apical spot; a second straight juxta-sutural oblique vitta extends from the base of the elytron to about two-thirds its length, the obliquity being from near

the scutellum outwards and backwards; ventral surface uniformly dark fuscous, legs dark testaceous. *Form* narrowly oval, not very convex with sides subparallel; *head* shining, very sparsely and minutely punctured; *maxillary palpi* dark testaceous, last article securiform, the apex strongly pointed; *pronotum* very shining, rather more strongly densely punctured than the head; *scutellum* small with a few minute punctures; *elytra* much more coarsely and thickly punctured than the pronotum; *ventral surface,* sternum moderately coarsely punctured except mesosternum, which is smoother in center; episternum of mesothorax more heavily punctured, abdominal segments with bases rather smooth but becoming more coarsely punctured and pubescent towards the sides; *legs* with ridges, somewhat pubescent.

Length.—♀ 2.25 mm., width 1.25 mm.

Type—♀ and two cotypes in my collection.

Type locality—Buffiington, Ind. (Pine Barrens) vii. 26. 10. (*A. B. Wolcott*).

This species can be readily separated from any of the other species by the elytral pattern and less convex subparallel form. The type was received from my friend, Mr. A. B. Wolcott.

Hyperaspis ploribunda n. sp.

♂ ♀—*Color*: Head, pronotum and scutellum black, elytra dark fuscous, palpi, antennae, tarsi and inflexed sides of elytra very dark testaceous. *Form,* oblong oval, depressed, somewhat widened posteriorly: *head* extremely finely, sparsely and shallowly punctured; *pronotum* finely and closely punctured; elytra less thickly and closely punctured than pronotum, the punctuation being thickest and coarsest towards the scutellum; the punctures are all very shallow; *ventral surface* sparsely and shallowly punctured.

♂ smaller than ♀, with sixth ventral slightly notched.

Length.—♂ 1.5 mm., ♀ 1.75 mm.

Width.—♂ 1.1 mm., ♀ 1.25 mm.

Type—♂ ♀ in my collection.

Type locality—Goldfield, Esmeralda Co., Nevada, vi. 29. 07. four specimens. (*Nunenmacher*).

When I first collected these insects I thought they were specimens of *H. arcuatus* Lec.

I wish to express my thanks to my friend Dr. Creighton Wellman, of Oakland, for advice and criticism during the preparation of this paper.

Mallophaga from Californian Birds.

By V. L. Kellogg and J. H. Paine, Stanford University, California.

The following determinations of Mallophaga and records of hosts are based on specimens taken from various birds at Monterey, California, by Mr. Jos. Clemans, Chaplain of the 15th Infantry Regiment, stationed at the Presidio.

Docophorus pertusus Nitzsch, var. **monachus** n. var.

One male from the Virginia rail, *Rallus virginianus* (Monterey, California).

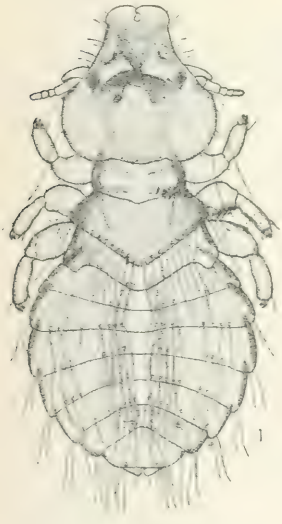


Fig. 1.—*Docophorus pertusus* Nitzsch. var. *monachus* n. var. Female.

The type, *D. pertusus,* has been found on the following birds in California: *Fulica americana, Erismatura rubida,* and *Colymbus nigricollis californicus.* The sinuous posterior margin of the first abdominal segment shown in the figure of the variety is also found in the type, though it has not been referred to heretofore.

The variety differs in the greater number of hairs found on the clypeus and on the abdomen. On the clypeus of the type there are two small hairs near the trabeculae while in the variety there are about eight on each side extending from the trabeculae to the expansion of the pincer-like organs. On the posterior margin of each segment of the abdomen in the type are found not more than four hairs while in the variety they are numerous, sixteen occurring on the fifth segment with the number diminishing anteriorly and posteriorly.

Docophorus pertusus Nitzsch.

One young specimen from the American coot *Fulica americana* (Monterey, Cal.)

Docophorus icterodes Nitzsch.

Specimens from the American coot, *Fulica americana* (Monterey, California.)

Docophorus platyrhynchus Nitzsch.

Specimens from the western red-tailed hawk, *Buteo borealis calurus* (Monterey, Cal.)

Docophorus communis Nitzsch.

Specimens from the shumagin fox sparrow, *Passerella iliaca unalaschcensis* (Monterey, Cal.)

Docophorus mirus Kellogg.

Specimens from Townsend warbler, *Dendroica townsendi,* (Monterey, Cal.)

Docophorus singularis Kellogg and Chapman.

Specimens from the varied thrush, *Hesperocichla naevia naevia.* (Monterey, California).

Docophorus incisus Kellogg.

Specimens from the pied-billed grebe, *Polidymbus podiceps, cidentalis,* (Monterey, Cal.)

Nirmus fuscomarginatus Denny var. **americanus** Kellogg.

Specimens from the pied-billed grebe, *Podilymbus podiceps* (Monterey, Cal.); also (straggler?) from the varied thrush, *Hesperocichla naevia naevia* (Monterey, Cal.)

Nirmus furvus Nitzsch.

Specimens from Wilson snipe, *Gallinago delicata* (Monterey, Cal.); also from Virginia rail, *Rallus virginianus* (Monterey, Cal.)

Nirmus fuscus Nitzsch.

Specimens from the western red-tailed hawk, *Buteo borealis calurus* (Monterey, Cal.)

Nirmus foedus Kellogg and Chapman.

Specimen from the black phoebe, *Sayornis nigricans semiatra* (Monterey, Cal.)' also (straggler?) from the pied-billed grebe, *Podilymbus podiceps* (Monterey, Cal.)

Nirmus vulgatus Kellogg.

Specimens from the Shumagin fox sparrow, *Passerella iliaca unalaschcensis* (Monterey, Cal.).

Oncophorus minutus Nitzsch.

Specimen from the American coot, *Fulica americana* (Monterey, Cal.); also (straggler?) from the western bluebird, *Sialia mexicana occidentalis* (Monterey, Cal.)

Oncophorus bisetosus Piaget, var. **californicus** Kellogg and Chapman.

Specimens from the Virginia rail, *Rallus virginianus* (Monterey, Cal.)

Lipeurus temporalis Nitzsch.

Specimens from the shoveller duck, *Spatula clypeata* (Monterey, Cal.)

Laemobothorium sp.

Two specimens from the desert sparrow hawk, *Falco sparverius deserticolus* (Monterey, Cal.) Until this genus is thoroughly revised we shall not attempt to make any species determination in it.

Physostomum sp.

One young specimen from Townsend warbler, *Dendroica townsendi* (Monterey, Cal.)

Trinoton luridum Nitzsch.

One specimen of this duck-infesting species, accredited, but certainly wrongly, to a desert sparrow hawk, *Falco sparverius deserticolus* (Monterey, Cal.) The insect probably came from the shoveller duck, *Spatula clypeata*.

Trinoton lituratum Nitzsch.

One specimen from the shoveller duck, *Spatula clypeata*, (Monterey, Cal.)

Colpocephalum stictum n. sp. (Fig. 2).

A single male specimen from *Gallinago delicata*, Wilson's snipe (Monterey, Cal.) This is an elongated species with conspicuous blotches on head, thorax and abdomen.

Description of Male.—Length 1.4 mm., width across abdomen .42 mm. Yellow brown in color with conspicuous dark chestnut markings.

Head.—Length .34 mm., width .4 mm., thus being unusually long in comparison with its width. Front slightly convex with three short spines on either side and two short hairs on the angles where the front merges into the diverging sides The prominent ocular emargination is almost filled by the eye and the last segment of the antennae. Ocular blotches dark chestnut; ocular bands indistinct except where they broaden to form light brown blotches at their anterior ends. The ocular fringe extends around the angle on to the temples. Temples broadly rounded, occiput concave. Two occipital triangles of dark chestnut color connected by a dark band on the occipital margin and extending forward. Occipital bands wanting. There are four hairs on the angle before the ocular emargination, one larger than the others; five hairs on the temple, three long and two shorter; also two hairs on the occiput near the center.

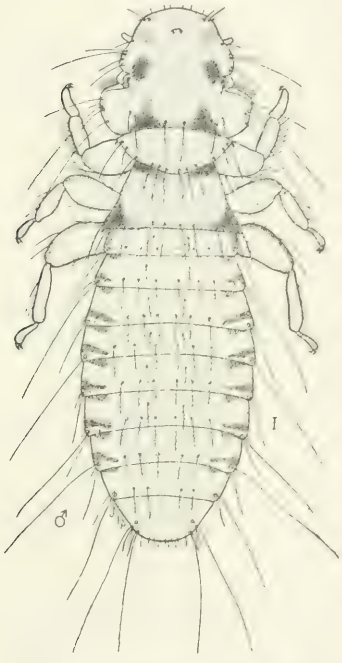


Fig. 2.—*Colpocephalum stictum* n. sp. Male.

Thorax.—Length .34 mm., width .34 mm. Prothorax lenticular, the anterior margin more flattened than the posterior, which latter bears a row of about twelve hairs. Metathorax trapezoidal; very dark chestnut blotches occurring in both anterior and posterior angles, and the latter angles bearing two hairs and a spine; also about six hairs on the posterior margin which is straight. Legs pale with a fringe of hairs on the outer edge of the tibia.

Abdomen.—Length .78 mm. Last segment rounded; lateral band of each segment, except the last, with two dark chestnut appendages curving inward, one at each end of the segment, becoming lighter in color in the posterior segments. Very long hairs in the posterior angles of some of the segments. A row of hairs across each segment and numerous short hairs around the posterior margin of the last segment. Transverse blotches slightly darker than general ground color of insect. Genitalia inconspicuous, being only slightly chitinized.

Colpocephalum flavescens Nitzsch.

Two males from the desert sparrow hawk, *Falco sparverius deserticolus* (Monterey, Cal.)

Menopon tridens Nitzsch.

Specimens from the pied-billed grebe, *Podilymbus podiceps* (Monterey, Cal.)

Menopon tridens Nitzsch, var. **pacificum** Kellogg.

Specimens from the pied-billed grebe, *Podilymbus podiceps,* the common loon, *Gavia imber,* the shoveller duck, *Spatula clypeata,* the American coot, *Fulica americana* and (straggler?) the desert sparrow hawk, *Falco sparverius deserticolus,* all from Monterey, California.

Menopon sp.

One specimen from the shoveller duck, *Spatula clypeata* (Monterey, California.)

A Remarkable Dragonfly (Odon.).

By Charles Louis Pollard, Public Museum, Staten Island Association of Arts and Sciences, New Brighton, New York.

In the account of a collecting trip in North Carolina last year, presented before the New York Entomological Society on December 21, 1909, by Mr. George P. Engelhardt and myself, reference was made to the capture of a dragonfly, *Gomphoides ambigua* Selys, as being the first record of the occurrence of this tropical American species within the United States (see Journ. N. Y. Ent. Soc. v. 18, p. 130).

The specimen, a male, was taken with numerous other Odonata on the shores of Greenfield Pond, near Wilmington, N. C., on August 1, 1909. I am unable to recall the circumstances of its capture, as I was engaged in general collecting at the time, and did not recognize the insect as unusual. It was sent with other species to Mr. R. P. Currie, of the United States Department of Agriculture, who made the following comment in returning it:

"*Gomphoides ambigua* has been reported hitherto only from Mexico and Guatemala and is thus new to the United States. It seems strange that it should have been taken in North Carolina."

When recently examining the collection of Odonata in the museum of the Staten Island Association of Arts and Sciences, Mr. Charles Schaeffer was inclined to question the identification, basing his opinion on two Mexican specimens in the Brooklyn museum, which had been determined by Professor Philip P. Calvert, and which differed from the Wilmington insect. I thereupon sent the latter to Professor Calvert, who courteously replied at length, giving the results of his examination. The letter is of such interest that it is quoted in detail:

"The dragonfly from Wilmington, N. C., which you sent me for determination falls under *Gomphoides ambigua* Selys, by my key to the Mexican, Central American and West Indian species of this genus in the Biologia Centrali-Americana, volume Neuroptera. A comparison with specimens shows, however, that the Wilmington example, while possessing the very distinct median notch in the posterior dorsal margin of the last abdominal segment of *ambigua*, differs from *ambigua* and agrees with *producta* Selys of the West Indies in having the somewhat dilated lateral margin of the 9th segment (viewed laterally in profile) convex throughout, instead of being convex in its anterior half and concave in its posterior half. The sheath of the penis of the Wilmington male is projecting, viewed laterally, as it is in *producta* but not in *ambigua*. There is also a slight difference in the shape of the hind dorsal margin of the 10th segment * * * * * *. The labrum, being chiefly pale green with only a narrow brown border on its free edge, is different from that of either *ambigua* or *producta*.

"*Producta* being the West Indian species, is what one would expect at Wilmington. From the above data your specimen seems to be intermediate between *ambigua* and *producta*. It is not outside the range of possibility that the

Wilmington male may belong to some species described from the female only. This is a difficult matter to decide in the absence of actual specimens of those species. I am, therefore, not able to say more than that your male does not agree with the descriptions or specimens of any male Gomphoides. * * *

"In any event, your Wilmington specimen is the most northern record for this genus known to me, and therefore a very interesting capture."

It is to be hoped that entomologists visiting the Wilmington region, and particularly the neighborhood of Greenfield Pond, will keep a sharp lookout for species of *Gomphoides* and related genera, as it is quite possible that the individual taken by me had been bred in the vicinity, and was not an accidental migrant from the West Indies.*

THE Department of Zoology and Entomology of the Ohio State University has recently received as a donation a fine collection of Lepidoptera from Mrs. Catherine Tallant, of Richmond, Indiana. The collection was made by Mr. W. M. Tallant during a series of years in the nineties and up to about 1905. It contains mainly species occurring in central Ohio, especially at Columbus, but has also a number of species from different parts of the United States and also some fine examples of species occurring in South America, Japan, China, India, Ceylon and Africa. The collection contains about 10,000 specimens in most excellent condition, very beautifully mounted, and many of the species contain very full series, showing variations, etc., which will make them of special value for scientific study. They are, for the most part, carefully identified, well preserved and will be kept under the name of the "Tallant Collection" in good cases and cabinets. Taken with the other collections in Lepidoptera, the collection of Odonata left by Professor Kellicott, and those in various groups which have been accumulated by the efforts of the members of the Department, the university is now provided with an excellent collection of insects including representatives in all the different orders. The total number of specimens probably approaches close to 100,000.—H. O.

*[According to Mr. Muttkowski's new catalogue of the Odonata of North America (Bulletin of the Public Museum of the City of Milwaukee, Vol. 1, art.1) the name *Gomphoides* Selys must be transferred to what de Selys and others have called *Progomphus* Selys. For the old *Gomphoides* Mr. Muttkowski proposes *Negomphoides*. If my view, set forth in the 'Biologia,' that *Gomphoides* Selys, *Cyclophylla* Selys, and *Aphylla* Selys are but one genus be accepted, the name *Negomphoides* is superfluous as *Cyclophylla* has priority.—P. P. CALVERT.]

A new Chalcidid from an Oak Gall (Hym.).

By T. D. A. Cockerell, University of Colorado, Boulder, Colo.

The beautiful Chalcidid here described was bred by Mr. E. R. Warren, the well-known Mammalogist, from galls of *Holcaspis* on an oak (*Quercus undulata* Torrey) at Trinidad, Colorado. The galls are like those of *H. rubens,* Gillette, but the single fly obtained seems different.

Syntomaspis warreni n. sp.

♀.—Length (exclusive of ovipositor) 4 1-3 mm.; ovipositor 5 2-5 mm.; wings ample, perfectly clear, venation pale fulvo-ferruginous; head broad, peacock green, with faint crimson tints, frontal depressions behind antennae shining golden; eyes bright terra-cotta red; mandibles red except at apex; sides of face very minutely rugosopunctate, sides of front becoming striatulate; scape and ring-joint ferruginous; flagellum black, the joints very minutely longitudinally keeled; mesothorax and scutellum with large thimble-like punctures, variegated with green and crimson, the posterior part of the scutellum minutely granular, with microscopical punctures, and with a marginal sulcus crossed by fine ridges; other parts of thorax variegated with green and purple; anterior coxae brilliant green; hind coxae very large, crimson-purple; femora and tibiae bright chestnut red; tarsi cream color, rufescent subapically, black at apex; lower margin of hind femora minutely denticulate beyond the middle, but with no large tooth; abdomen brilliant magenta, with blue-purple shades, first segment with a very large flap, which is strongly notched posteriorly; second segment carinate, deeply notched in middle; third segment also deeply notched; hind tibiae with two spurs; stigma sessile; ovipositor chestnut-red, its sheath black.

Type in U. S. National Museum.

Mr. J. C. Crawford has kindly compared this insect with the material in the National Museum, and writes that it comes very close to *Syntomaspis californicus* Ashm., which is greenish or golden greenish, without the purple tints. The species is one of those which might be assigned either to *Torymus* or *Syntomaspis.*

At the annual meeting of the Pennsylvania Horticultural Society held December 20th, in Philadelphia, Dr. Henry Skinner was re-elected Professor of Entomology for 1911.

ENTOMOLOGICAL NEWS.

[The Conductors of ENTOMOLOGICAL NEWS solicit and will thankfully receive items of news likely to interest its readers from any source. The author's name will be given in each case, for the information of cataloguers and bibliographers.]

TO CONTRIBUTORS.—All contributions will be considered and passed upon at our earliest convenience, and, as far as may be, will be published according to date of reception. ENTOMOLOGICAL NEWS has reached a circulation, both in numbers and circumference, as to make it necessary to put "copy" into the hands of the printer, for each number, four weeks before date of issue. This should be remembered in sending special or important matter for a certain issue. Twenty-five "extras," without change in form, will be given free, when they are wanted: and this should be so stated on the MS., along with the number desired. The receipt of all papers will be acknowledged.—Ed.

PHILADELPHIA, PA., FEBRUARY, 1911.

The versatility of insects is well shown by the inducements which they hold out to man to serve as the objects of his most varied study. From papers and references in this number of the NEWS we find them continually increasing his catalogues of animal forms, exercising his ingenuity to escape their unwelcome personal attentions to his body, serving as the material for experiments on the method and manner of inheritance or for the examination of minute details of the structure of the living cell, illustrating complicated problems of physics, disturbing his ideas of the operations of climatic influences upon life. All these branches of human intellectual activity are of the larger Entomology wherein each of us who reads these lines tries to do his part.

DR. A. A. MICHELSON, of the University of Chicago, delivered the seventh lecture upon the J. C. Campbell Foundation of the Sigma Xi Society of the Ohio State University on the evening of December 2. His subject was "Metallic Colors in Birds and Insects." The lecture was amply illustrated by lantern and reflectoscope and was concluded by an explanation of the most probable cause as found by the lecturer as a result of his researches.—*Science*, Dec. 23, 1910.

Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE.

THE Liverpool School of Tropical Medicine has been able to offer Liverpool University $50,000 for the establishment of a chair in Tropical entomology. At a meeting of the Council of the University it was resolved gratefully to accept the offer.—*Science*, Jan. 6, 1911.

ANNOUNCEMENT of the Journal of Animal Behavior and the Animal Behavior Monograph Series.—In response to a widely felt and urgent need for a periodical in which studies of the behavior and mental life of organisms may satisfactorily be published a journal and a monograph series have been planned. The Journal of Animal Behavior will accept for publication field studies of the habits, instincts, social relations, etc., of animals, as well as laboratory studies of animal behavior or animal psychology. It is hoped that the organ may serve to bring into more sympathetic and mutually helpful relations the "naturalists" and the "experimentalists" of America, that it may encourage the publication of many carefully made naturalistic observations which at present are not published, and that it may present to a wide circle of nature-loving readers accurate accounts of the lives of animals. Beginning with January, 1911, the Journal will appear bi-monthly in numbers of approximately 75 pages. Each annual volume of six numbers will consist of not less than 450 pages. The subscription price will be $3.00 per volume (foreign, $3.50). This low price to subscribers can be maintained only if those who are interested in the study of the behavior and psychology of animals promptly subscribe and work for the support of the Journal. The Journal is under the editorial direction and management of I. Madison Bentley, Assistant Professor of Psychology, Cornell University; Harvey A. Carr, Assistant Professor of Psychology, University of Chicago; Samuel J. Holmes, Assistant Professor of Zoology, University of Wisconsin; Herbert S. Jennings, Henry Walters Professor of Zoology, Johns Hopkins University; Edward L. Thorndike, Professor of Educational Psychology, Teachers' College of Columbia University; Margaret F. Washburn, Professor of Psychology, Vassar College; John B. Watson, Professor of Experimental and Comparative Psychology, Johns Hopkins University; William M. Wheeler, Professor of Economic Entomology, Harvard University, and Robert M. Yerkes, Assistant Professor of Comparative Psychology, Harvard University. The Journal is not the property of any individual, and it is to be conducted solely in the interests of those branches of science which it represents. All income from subscriptions and other sources, above that necessary for the support of the pub-

lication as it is planned, is to be devoted to its improvement and enlargement. Reviews of especially important contributions within its field will be published as they are prepared, and, in addition, a number especially devoted to reviews, digests, and a bibliography of the contributions to animal behavior and animal psychology for the year will be published annually. This review number is to be in charge of an Editor of Reviews It is hoped that this special number may prove of value to those readers whose library facilities are meager. The Animal Behavior Monograph Series will be published in connection with the Journal as a provision for papers which are too lengthy, or, for other reasons, too costly to be accepted by the Journal. The monographs of this series will appear at irregular intervals, and they will be grouped in volumes of approximately 450 pages. The separate monographs will be sold at prices determined by the cost of manufacture, and the volume will be sent to regular subscribers for the price of $3.00 (foreign, $3.50). Subscribers to the Journal are urged to subscribe also to the Monograph Series. The Journal of Animal Behavior and the Animal Behavior Monograph Series will be published for the Editorial Board by Henry Holt and Company, New York. Manuscripts for the Journal may be sent to the managing editor, Professor Robert M. Yerkes, Emerson Hall, Cambridge, Massachusetts, or to any other member of the Editorial Board. Manuscripts for the Monograph Series should be sent to the editor, Professor John B. Watson, the Johns Hopkins University, Baltimore, Maryland, from whom information may be obtained concerning terms of publication. Books and other matter for review in the Journal should be sent to the editor of reviews, Professor Margaret F. Washburn, Vassar College, Poughkeepsie, New York. All business communications should be addressed to the Journal of Animal Behavior, Cambridge, Mass.

Notes on Limnobia Parietina O. S.—The splendid crane-fly, *Limnobia parietina* O. S., has always been regarded as somewhat of a rarity. It was described by Baron Osten Sacken in 1861, from specimens taken at Trenton Falls, N. Y., "on fences, in September, numerous ♂ and ♀ specimens." It has since been recorded from the White Mountains, New Hampshire, and more recently (1909), Prof. C. W. Johnson has added a few more records: Prout's Neck, Me.; Intervale and Hampton, N. H., and Lake Ganoga, North Mountain, Pa. I have mentioned the occurrence of the species in Fulton County, N. Y., in Ent. News for June, 1910. I have the following notes to add:

In early September, 1910, a friend and I were on a long fishing tramp up into Hamilton Co., N. Y. On the morning of the 2d, while passing from Silver Lake, near Arietta, to the White House on the

west branch of the Sacandaga River, I noticed an abundance of a large Tipulid flying about in the dense woods. They proved to be *Limnobia parietina.* The woods along Nine-Mile Creek were dark and gloomy, and very little sunshine penetrated to the ground below. When the *parietina* passed from the shadows into the bright sunlight they looked very large and conspicuous. There were hundreds of specimens about, and they were the only large crane-fly in this sort of habitat. They would fly lazily from some resting place, and usually alight on the trunk of some nearby tree, head upward. I picked seven ♂'s and one ♀ from such places, or seized them as they flew slowly past. It is a notable late summer species, all of the records being for late August or September.—CHAS. P. ALEXANDER, Ithaca, N. Y.

THE COLEOPTERORUM CATALOGUS, published by W. Junk, Berlin, edited by S. Schenkling, began publication September 15, 1909. Up to January 1, 1911, the following parts have appeared: 1. R. Gestro, Rhysodidae; 2. F. Borchmann, Nilionidae, Othniidae, Aegialitidae, Petriidae, Lagriidae; 3, Alleculidae; 4, M. Hagedorn, Ipidae; 5, R. Gestro, Cupedidae et Paussidae; 6, H. Wagner, Curculionidae, Apioninae; 7, H. von Schönfeldt, Brenthidae; 8, van Roon, Lucanidae: 9, E. Olivier, Lampyridae; 10, E. Olivier, Rhagophthalmidae, Drilidae; 11, A. Léveillé, Temnochilidae; 12, E. Csiki, Endomychidae; 13, Scaphidiidae; 14, M. Pic, Hylophilidae; 15, H. Gebien, Tenebrionidae I; 16, P. Pape, Brachyceridae; 17, Ph. Zaitzev, Dryopidae, Cyathoceridae, Georyssidae, Heteroceridae; 18, E. Csiki, Platypsyllidae, Orthoperidae, Phaenocephalidae, Discolomidae, Sphaeriidae; 19, M. Bernhauer et K. Schubert, Staphylinidae I; 20, A. Schmidt, Aphodiinae; 21, K. Ahlwarth, Gyrinidae; 22, H. Gebien, Tenebrionidae II; 23, H. Bickhardt, Histeridae. Part 24, S. Schenkling, Cleridae. is announced for immediate publication. All the other families are in preparation. The publisher thinks that there is little doubt that the "Catalogus" will be completed in about six years. Supplements will be published regularly after completion of the work. The literature on the biology and development of beetles, chiefly of the injurious species, will be listed with special care.

THE announcements of the Free Lectures of the Ludwick Institute to be given in 1911 at the Academy of Natural Sciences of Philadelphia, contain the following references, direct or indirect to Entomology.

Scientific Explorers of America and Their Discoveries. By Henry A. Pilsbry, Sc.D., Special Curator, Department of Mollusks, Academy of Natural Sciences, Philadelphia. Illustrated by lantern slides. Mondays at 8 P. M. February 13: Voyages of the XV., XVI., XVII. Centuries and their Geographical Discoveries. Illustrated with reproductions of interesting early maps and charts, showing the progress of knowledge of western geography. February 20 and 27: Zoological and Botanical Explorers and Writers of the XVI. and XVII. Centuries—Hernandez, Sir Hans Sloane, Bartram, etc. March 6: The Great Explorers of South and Central America and their Zoological Discoveries. March 13: Early North American Explorations.

Entomology. By Henry Skinner, M.D., Conservator, Entomological Section, Academy of Natural Sciences, Philadelphia. Illustrated by

colored lantern slides. Thursdays at 8 P. M. February 16: Lepidoptera, Butterflies and Moths; their life histories, habits, transformations and distribution. February 23: Economic Entomology: Insects of the Household and the Farm; Crop and Fruit-tree Pests; the San Jose scale, gypsy moth, brown-tail moth, tussock moth and other shade-tree pests. March 2: The Social Insects or Hymenoptera, Bees, Wasps and Ants; their habits, architecture and communities. March 9: Insects and Disease. Parasitism. Ticks and mites in relation to Texas fever, spotted fever and relapsing fever. Horse-flies, stable-flies, punkies, blow-flies, jigger-fleas, bed-bugs. House-flies in relation to typhoid fever and tuberculosis. March 16: Insects and Disease. Mosquitoes, their life history; mosquitoes in relation to malaria, yellow fever and filaria. Sleeping sickness and the tsetse fly. Some tropical diseases transmitted by insects.

Animal Coloration and Its Significance in Evolution. By J. Percy Moore. Illustrated by lantern slides. Thursdays at 8 P. M. March 23: Physical and Physiological Basis of Animal Color. Color in Relation to Function and Environment. Color Patterns. March 30: Non-adaptive and Adaptive Coloration. Types of Adaptive or Useful Coloration. April 6: Concealing Coloration. April 13: Warning Colors. Mimicry, etc. Changeable Colors. Dichromatism and Related Phenomena. April 20: Behavior of Color in Heredity. Conclusion.

HAS anyone had any experience with gas lamps used for attracting moths? I am thinking of buying a 2,000-candlepower gasoline lamp to use in catching moths. A friend of mine in Chicago thinks a gas lamp will not attract moths, at least not nearly so many as an electric or kerosene lamp will do. He claims the light is too white. I am anxious to hear from someone who has had actual experience.—A. F. PORTER, Decorah, Iowa.

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), excluding Arachnida and Myriapoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded. The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published, and are all dated the current year unless otherwise noted. This (*) following a record, denotes that the paper in question contains description of a new North American form.

For record of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington.

2—Transactions, American Entomological Society, Philadelphia. **4**—The Canadian Entomologist. **5**—Psyche, Cambridge, Mass. **6**—Journal, New York Entomological Society. **7**—U. S. Department of Agriculture, Bureau of Entomology. **11**—Annals and Magazine of Natural History, London. **16**—Bulletin, Societe Nationale d'Ac-

climation de France, Paris. **18**—Ottawa Naturalist. **22**—Zoologischer Anzeiger, Leipzig. **24**—Berliner Entomologische Zeitschrift. **38**—Wiener Entomologische Zeitung. **40**—Societas Entomologica, Zurich. **45**—Deutsche Entomologische Zeitschrift. **47**—The Zoologist, London. **55**—Le Naturaliste, Paris. **81**—Biologisches Centralblatt, Erlangen. **84**—Entomologische Rundschau. **92**—Zeitschrift fur wissenschaftliche Insektenbiologie, Berlin. **97**—Zeitschrift fur wissenschaftliche Zoologie, Leipzig. **102**—Proceedings, Entomological Society of Washington. **143**—Ohio Naturalist, Columbia. **179**—Journal of Economic Entomology. **180**—Annals, Entomological Society of America. **183**—The Glasgow Naturalist. **189**—Pomona Journal of Entomology, Claremont, Cala. **193**—Entomologische Blatter, Nurnberg. **216**—Entomologische Zeitschrift, Stuttgart. **278**—Annales, Societe Zoologique Suisse et du Museum d'Histoire de Geneve, Revue Suisse de Zoologie. **279**—Jenaische Zeitschrift fur Naturwissenschaft, Jena. **287**—Proceedings, Royal Society of Victoria (new Series), Melbourne. **301**—Verhandlungen und Mitteilungen des Siebenburgischen Vereins fur Naturwissenschaften zu Hermannstadt. **302**—Mitteilungen, Naturwissenschaftlichen Vereins an der Universitat Wien. **303**—Entomologiske Meddelelser, udgivne af Entomologisk Forening, Copenhagen. **304**—Annals, Carnegie Museum. **305**—Deutsche Entomologische National-Bibliothek, Berlin.

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Mosquito or Man? The conquest of the tropical world.—In spite of all the interest aroused in the past decade on the subject of the relation of insects to disease, authoritative discussions, which, at the same time are thoroughly interesting for the non-technical reader, are rare. There has recently appeared such a book, which holds one's interest from beginning to end,—Sir Rubert Boyce's "Mosquito or Man."* By ability to present the facts in a readable, popular style, no less than by a broad first-hand knowledge of his subject, the author, who is dean of the Liverpool School of Tropical Medicine, is peculiarly qualified.

It is in the field of tropical medicine that the application of the discoveries of the relations of insects to the transmission of disease has been most far-reaching, and Sir Rubert has fittingly given his book the sub-title "The Conquest of the Tropical World." After a brief discussion of the foundation of the tropical medicine movement in England, he traces the growth of general and applied sanitation in the tropics and emphasizes that the greatest value of measures along this line has been in the fact that indirectly and incidentally they resulted in a reduction in numbers of disease-carrying insects. For instance, modern methods of obtaining water supplies have resulted in a great reduction of yellow fever throughout the West Indies in the past fifty years. But, "the significance of the relationship of the diminution of yellow fever to the introduction of pipe-borne water is due entirely to the fact that there has been of necessity a diminution of the common breeding places of the house mosquito—the *Stegomyia calopus*—the sole carrier of yellow fever."

An entertaining and concise account of the discoveries which underlie our present knowledge of insects as carriers of disease is preceded by a chapter on "Miasm, Tradition and Prejudice." As one who has taken part in many campaigns against disease Dr. Boyce has good reason to know the depth to which the old doctrine of the miasmatic origin of malaria and yellow fever is rooted.† The popular mind is not yet freed from the idea of "the deadly miasm, which surrounds you on all sides, which you encounter at its worst in the cool eventide or early morning," and even yet, in many regions, it is regarded as a matter of course that the newcomer must fall a prey to the "acclimation fever." On account of this deep-seated belief in man, the pioneer finds it far more easy to overthrow the strongholds of the disease-carrying

* *Mosquito or Man?* The Conquest of the Tropical World. By Sir Rubert Boyce, M.B., F.R.S. London, 1909. John Murray. $3.50.

† One of our best dictionaries in its revised, 1909 edition, defines malaria as a fever produced by "morbific exhalations arising from swamps or effluvia from the decomposition of animal or vegetable matter."

mosquito than to overthrow this deep-seated prejudice, which begets apathy and indifference, characteristic of the tropical countries where these diseases are so prevalent.

But now, in all parts of the world the campaign against insect carriers of disease is being waged. Most instructive are the accounts—often from personal experience—which the author gives of the results of this movement. For instance, the early history of yellow fever shows in some epidemics a mortality rate of 69 per cent. It was not from want of good food or water, or accommodation that men perished. "No, they were struck down by some unseen hand, and medicine said that that hand was the miasm. Today we know it to be the mosquito and whereas formerly, acting on the miasm theory not one life was ever saved, today, armed with the new knowledge, we visit the miasmatic countries with the same feeling of security that we do when we pay a visit to the continent."

A valuable feature is the discussion of plans of campaign against the guilty mosquito. Especially interesting to the American reader is the detailed account of the fight against yellow fever in New Orleans, in 1905, in which Dr. Boyce, as volunteer, played an important part. The book is not limited, as its title would imply, to a consideration of the mosquito in the transmission of disease but considers also, though briefly, the part played by other insects—the tsetse-fly, the rat flea, ticks, and the housefly. The hookworm, too, is briefly included in the discussion.

Altogether, the volume is a fascinating one and should be read by every one who wishes to keep in touch with the advances of preventative medicine. He will put it down with the conviction that the author is justified in his claim that the tropical world, long retarded in its development by its reputation as "the white man's grave," is today being steadily and surely conquered. "The three great insect-carried scourges of the tropics—the greatest enemies that mankind has ever had to contend with, namely malaria, yellow fever and sleeping sickness—are now fully in hand and giving way, and with their conquest disappears the awful and grinding depression which seems to have gripped our forefathers. * * * The tropical world is unfolding once again to the pioneers of commerce who now do not dread the unseen hand of death as did of old the Spanish Conquistadores of Columbus and Cortes."—Wm. A. Riley, Cornell University.

Annual report of the New Jersey State Museum, including a Report of the Insects of New Jersey, 1909.—This contains the Curator's Report; Insects, their Classification and Distribution and a Systemic List of the Insects of the State, Alphabetical Index to Localities,

Explanations of Abbreviations and Acknowledgments, Summary and Index. This is another edition of Prof. John B. Smith's well known New Jersey list of insects. Two previous lists have appeared, the first in 1890 and the second in 1900. The first list contains the names of 6098 species, the second 8537 and the present list 10385. The work is intended to aid students and collectors and also to encourage the study of entomology, particularly economic, among teachers, farmers, fruit growers and other persons who should be interested in this important subject. The success of this State list has led to similar records being kept in other States, with a view of publication, and sooner or later, we will see them in print. Work of this kind will greatly enhance our knowledge of distribution and will be useful in the study of many problems connected with both economic and systematic entomology.—H. S.

Doings of Societies.

FELDMAN COLLECTING SOCIAL.

At a regular meeting held November 16th, 1910, at 1523 South Thirteenth street, Philadelphia, fifteen members were present. President Harbeck in the chair.

Mr. H. A. Wenzel spoke of a collecting trip made in August to Pocono Lake, Pa., in company with Mr. Greene, of Easton, and mentioned the interesting species collected. Among the rarer were *Aphodius leopardus* Horn, *A. rubripennis* Horn and *Dialytes striatulus* Say, all collected in cow manure along the trails in the thick woods. The latter was also taken under the fallen needles of the pine. These three species had been previously taken by himself and father at high altitude in Balsam Mountains, N. C. He went thro' five or six ant hills with no success. Found three or four species of *Necrophorus* on dead animals and in traps. Mr. H. W. Wenzel said that *A. rubripennis* was a mountain species and by no means common; had previously been recorded as found only under bear dung; also made some remarks on and displayed his collection of *Geotrupes* and a pupa of one, probably *G. semiopacus* Jec.; described the tunnelling of species of this genus and, when they strike an obstruction in the shape of a stone, the manner in which they dig around it.

Mr. Daecke said he had found *Cicindela rufiventris* Dej. on the top of a mountain near Harrisburg; was surprised to find it there as it is found in just the opposite conditions in New Jersey.

Mr. Harbeck said since finding at Trenton, N. J., the sawfly with "four antennae" recorded at the October, 1909, meeting, he had found another at the same place and one at Manahawkin; he questioned whether they were all freaks or whether there was a genus with this characteristic.* This led to a general discussion on the subject of freaks including mammals, plants and insects. Adjourned to the annex.

GEO. M. GREENE, Sec'y.

AMERICAN SOCIETY OF ZOOLOGISTS.

At the eighth annual meeting of the Eastern Branch, held at Cornell University, Ithaca, New York, December 28-30, 1910, the following papers of an entomological character were read: Dr. N. M. Stevens (Bryn Mawr College) Heterochromosomes in Mosquitos. Contrary to the previous experience of the speaker that when heterochromosomes were found in one member of a genus or family of Coleoptera, Diptera or Hemiptera, they are also to be found in other members of the same group, she found heterochromosomes clearly differentiated in *Anopheles* but not differentiated in *Culex* and *Theobaldia;* this non-differentiation was used as an argument against the idea that heterochromosomes are sex-determinants. Prof. T. H. Montgomery, Jr. (University of Pennsylvania), Origin and significance of Mitochondria. This granular constituent of cells was studied in living sperm cells of *Euschistus* (Hemipteron) and was considered to be due not to an extrusion of chromatin from the nucleus but probably to a chemical interaction between nuclear and cytoplasmic material; it was suggested that cells receiving much mitochondria may become somatic cells, those receiving little mitochondria may become

* Mr. E. T. Cresson stated, without having seen these specimens, that they were perhaps males of *Lophyrus*.—EDS.

germ cells. Prof. P. P. Calvert (University of Pennsylvania), Newly Found Odonate larvae of special interest from Costa Rica. Larvae of *Cora* with anterior abdominal tracheal gills and of *Mecistogaster modestus* from water between leaf bases of arboricolous bromeliads were described and the transformation of the latter species shown by a series of photographs from life. Dr. A. Petrunkevitch (Yale University) The senses, courtship and mating in tarantulas, and A case of regeneration in tarantulas, illustrated by very interesting photographs and demonstrations. Prof. T. H. Morgan (Columbia University), The origin and heredity of four wing mutations in *Drosophila,* and The heredity of red eyes, white eyes and pink eyes in *Drosophila.*

At the meeting of the American Society of Naturalists held in conjunction with the Eastern Branch of the Zoologists, Prof. Morgan contributed a paper also dealing with *Drosophila* under the title: The application of the conception of pure lines to sex-limited inheritance and to sexual dimorphism, while Prof. J. H. Gerould (Dartmouth College) spoke on Polymorphism and inheritance in *Colias philodice.*

For the meetings of the Central Branch of the American Society of Zoologists in conjunction with Section F, Zoology, A. A. A. S., held at Minneapolis, Minn., December 28, 29 and 30, 1910, the following entomological papers were announced: J. F. Abbott (Washington University), Poulton's Theory of the Origin of Mimicry in Certain Butterflies; S. R. Williams (Miami University), Comparison of the Arrangement of the Eggs in the Nests of Japyx sp. and Scutigerella immaculata; S. J. Hunter (University of Kansas), On the Transition from Parthenogenesis to Gameogenesis in Aphids. II. (Lantern); Fernandus Payne (University of Indiana), The Pomace Fly Bred in the Dark for 67 Generations; C. E. McClung (University of Kansas), Chromosome Individuality; J. A. Nelson (U. S. Dept. of Agriculture), Origin of the Rudiments of the Mesenteron of Honey Bee; W. J. Baumgartner (University of Kansas), Spermatogenesis in the Mole Crickets.

EXCHANGES.

Not Exceeding Three Lines Free to Subscribers.

☞ These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Coleoptera exchanged for native or exotic specimens new to my collection. List on application.—Emil Liljeblad, 1018 Roscoe St., Chicago, Ill.

Diptera—Will give duplicates in exchange for identification.—A. J. Weidt, 439 Washington Street, Newark, N. J.

Duplicates—Fine *Parnassius* ex. Thian-Shan, Turkestan, including *romanovi*, *appolonius* and ab. *flavomaculata*, *Staudingeri*, *nubilosus*, *intermedius*, etc.; rare Saturnids in paper as: *Philosamia*, *ricini*, *Attacus*, *Edwardsi*, *atlas;* var. ex. *java: Argema mimosæ; Actias selene; Antheræa mylitta* and var. *sivalica; Nudaurelia menippe*, *ringleri*, *caffraria*, etc., *Cricula andrei* n. sp.; life histories. Cocoons, hybrid *cynthia* x *ricini* (Bengal) and plenty of common species in papers and cocoons. Will take in exchange cocoons or moths of rare Saturnids or Parnassius; particularly want *Calleta*, *Colombia* cocoons—any Arizona, California or New Mexico species of *Hemileuca* or *Saturnia*.—J. Henry Watson, 70 Ashford Road, Withington, Manchester, England.

I have for exchange living pupae of *P. asterias*, *Sp. achemon*, *quinquemaculata*, *sexta*, *chersis*, *A. luna*, *A. myron*, *A. aurora*, *E. tityrus* and *octomaculata*. Want pupae of others not in my collection.—Joseph N. Lang, 619 Bunker St., Chicago, Ill.

Lepidoptera—I have for exchange living pupae of *Adelocephala bicolor*, *Sphinx jamaicensis;* also in papers, *Meganostoma caesonia*, *Apantesis virguncula* and *Catocalae*.—James Tykal, 2807 Ridgeway Avenue, Chicago, Ill

Micro-Coleoptera—Isaac B. Ericson, Molndal, Sweden, is working up the Micro-Coleoptera of the world and desires to exchange specimens.—G. A. Akerlind, 664 Monadnock Block, Chicago, Illinois, will act as intermediary if desired.

Wanted—In the spring or early summer, four live female *Anosia plexippus* to be posted to England, liberal prices paid.—Kindly apply to Hon. N. Charles Rothschild, Arundel House, Kensington Palace Gardens, London, W.

Will purchase Cicindelae in series of the more common forms from all over the United States. Dates and localities necessary.—E. D. Harris, 280 Broadway, New York.

Butterflies—I will name **spread** North American butterflies. Many rare species for exchange.—Dr. Henry Skinner, Logan Square, Philadelphia, Penna.

Wanted—Specimens of the Coccid genus *Lepidosaphes* (formerly *Mytilaspis*) for study. Will name and return.—H. T. Fernald, Amherst, Mass.

Japanese Butterflies and others. *Papilio*, *Charaxes*, *Hestinia*, *Euripus*, Saturnids, Sphingids from Formosa. Wanted Butterflies from any part of the world, especially tropical region.—T Fukai, Konosu, Saitama, Japan.

Cocoons and chrysalids of *C. promethea* and *P. troilus* for exchange for Lepidoptera in papers.—Edwin P. Meiners, 2624 N. Garrison Ave., St Louis, Mo.

Catocalae and other Lepidoptera. Eggs of *innubens*, *cara*, *amatrix*, *ilia*, *piatrix* and hickory feeders. Also pupae of *regalis*, *imperialis*, *luna*, *modesta* and *P. ajax*, *troilus* and *cresphontes*.—H. A. Davenport, R. D. No. 3, Louisiana, Mo.

Lepidoptera for exchange from 1910, on pins, all named; also pupae of *cresphontes*, *troilus*, *turnus* for others.—F. Mulkmus, 3735 Cottage Ave., St. Louis, Mo.

Wanted—Elateridae and Buprestidae for other named Coleoptera. I also desire to exchange entomological bulletins of the various Experiment Stations for others not in my library, and for bulletins on plant pathology. Send lists.—C. O. Houghton, Delaware College, Newark, Delaware.

Lepidoptera on pins from this locality for exchange.—Ernst Frensch, Box 622, Stonington, Conn.

Stockhausen. Printer, 53-55 N. 7th Street, Philadelphia.